AUSTRALIAN SOCIETY FOR LIMNOLOGY

NEWSLETTER

VOLUME 27. NUMBER 3. AUGUST 1989

Registered by Australia Post
Publication No. WBG2179

Australian Society for Limnology

Office-Bearers - 1989/90

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Australian Society for Limnology Newsletter

Volume 27 Number 3 August 1989

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Material for publication in the November issue of the Newsletter should be sent to the Editor before 21 st October 1989.

Fax (09) 332 2507.

Long articles would be appreciatively received in any one of the following three modes: as camera-ready laser printed copy (New York, 12pt, fully justified), as formatted text on Macintosh disc, or as unformatted text on IBM or IBM compatible discs.

Australian Society for Limnology

The Australian Society for Limnology is an association of over 400 people with professional or amateur interests related to Australian inland waters. Since its inception in 1961, the Society has played an important role in fostering limnology in this country. The ASL promotes liaison between limnologists in academic, private and governmental institutions and has a vested interest in the conservation of aquatic and related resources. Annual conferences are held near centres of limnological interest, and the programme includes scientific sessions, field excursions and social activities.

The ASL produces a newsletter with notes on activities, articles of general interest, book reviews and conference announcements; a Bulletin of original scientific papers and occasional Special Publications. A further publication is the Directory of Australian Limnologists.

Membership details

Membership applications are welcome; five classes of subscribing membership are available:

Ordinary Members:	$20.00
Student Members:	$10.00
Life Members:	$200.00
Institutional Members:	Fees on application
Sustaining Members:	Fees on application

Membership subscriptions cover the period from 1 July to 30 June and members receive all publications. Members may also choose to receive the Australian Journal of Marine and Freshwater Research, the Australian Journal of Zoology and/or the Australian Journal of Botany at reduced rates. The subscription period for each journal is the calendar year following the year in which the subscription is paid.

Enquiries relating to membership should be directed to:

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Treasurer/Membership Officer ASL
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Editorial

This issue is almost entirely devoted to the Canberra Conference and to ensure that it reaches you, bulging with abstracts, without too long a delay, we have foregone hassling the State representatives for news. However, be warned, we are expecting voluminous contributions from the new Executive members for the November edition.

Thanks are due to Richard Norris, Bill Maher and the rest of the CCAE gang who produced the largest ASL conference to date.

Running a conference is no easy task and they provided us with a format that resulted in perhaps the best collection of papers that have been presented at an ASL conference so far.

Thanks also to Adrian Pinder and Fiona Whittles who have provided the Canberra Centrefold !!

Finally , once again this issue is going to press largely due to the efforts of Fiona Whittles and the Stream and Wetland Ecology Group at Murdoch - whilst the Editor disappears in the direction of the airport and SIL
-Many thanks folks,

Jenny Davis

Abstracts

WHERE DO TROPICAL AND SUB-TROPICAL LOTIC MACROINVERTEBRATE COMMUNITIES LIE IN THE LATITUDINAL SPECIES DIVERSITY GRADIENT? A REVIEW OF AUSTRALIAN STUDIES

A H Arthington, CCISR, Griffith University
Nathan, QLD 4111

Recent comparisons of macroinvertebrate species diversity in eastern Australian lotic systems by Shiel and Williams suggest that tropical lotic communities may be more diverse or not noticeably less rich than their temperate counterparts. This conclusion was based on data from only four river systems, with no replication within major geographic regions, and did not take into account fundamental differences between the systems which influenced estimates of total species richness. Such differences include: the physical characteristics of the river systems and reaches studied (altitude, gradient, size and substrate characteristics), the degree of disturbance or pollution of the study areas, and the sampling methods and intensity used to examine the lotic macroinvertebrate fauna. The objectives of this paper are to review eastern Australian studies on lotic macroinvertebrate community diversity, taking into account differences between the studies as outlined above. In so doing I present evidence of a perhaps uncommon latitudinal gradient in species richness, ie. a higher diversity in some sub-tropical and temperate streams than in their tropical counterparts.

L.A. BARMUTA, K. KRATZ, S. HAMILTON, S.D. COOPER & J.M. MELACK. Department of Biological Sciences, University of California, Santa Barbara, CA 93106, U.S.A.. Experimental acidification of enclosures in a high alpine lake.

18 1-m diameter plastic enclosures were set up in Emerald Lake in the Sierra Nevada in summer 1987. Six levels of acidification were chosen ranging from pH 4.7 to pH ca. 6.3 (control) and were maintained at the nominated pH for 36 days. The responses of zooplankton and macro zoobenthos were monitored. Of the zooplankton, Daphnia rosea and Diaptomus signicauda declined with lowered pH, whilst Keratella taurocephala and Bosmina longirostris showed the opposite response. However, Bosmina was depleted in the most acidic treatment and at this site appears less tolerant of acidification than elsewhere in North America. Zoobenthos showed no significant responses to acidification.

DAPHNIA, STATEGIC DEFENCE INITIATIVES: POND WARS

(Michael Barry, Dept. of Zoology, Monash University)

Daphnia carinata produces a protective crest in response to predatory notonectids. The aim of the present study was to determine why *Daphnia* lose their crests in the absence of the predators.

A life history study indicated that crested morphs took longer to reach maturity and devoted less energy to reproduction than their uncrested counterparts. Crested *Daphnia* initially produced smaller broods of neonates but in latter instars released significantly larger numbers than the uncrested animals.

Respiration and assimilation rates were similar in both morphs, but crested animals lost consideraby more tissue in molts. The brood pouch was also structurally smaller in crested *Daphnia*. The physiological data was combined with information on growth to construct a model simulating development of the two phenotypes.

REMOTE SENSING OF WETLANDS WATER REGIMES AND VEGETATION CHARACTERISTICS

M. Barson and R. Johnston
Bureau of Rural Resources

Community recognition of the importance of wetlands is growing and many government agencies are now, as a matter of priority, examining ways in which remaining wetland environments can be enhanced through the integration of land and water management policies. Recent Australian reports examining wetlands management techniques indicate that the available ecological data are insufficient to meet management needs. Primary requirements include a rapid, cost effective method for wetlands inventory, methods for mapping major wetland habitat types, and techniques for determining water requirements of riverine wetlands. This project aims to examine the potential of remote sensing techniques to provide this information.

EUTROPHICATION OF THE GIPPSLAND LAKES - THE ROLE OF PHOSPHORUS RELEASE FROM LAKE SEDIMENTS

Bergman, I.D., Maher, W.A. and Taylor, G.
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PO Box 1
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For several months in early 1988 the Gippsland Lakes in south-east Victoria experienced a major bloom of a Cyano Bacteriales Nodularia spumigena (blue-green algae). The bloom is thought to have originated in the central areas of the lakes system, and to have been dispersed by wind and water currents.

This paper describes a series of experiments designed to establish whether lake sediments were the major source of phosphorus causing the bloom. Measurements were made **in situ** of the sediment phosphorus flux, the physiocochemical status (temperature, dissolved oxygen, redox potential, pH and salinity) of the overlying lake water, the sediment redox potential and the phosphorus content of the sediments. Under anoxic conditions, high rates of phosphorus release from sediments (up to 500 $mg/m^2/day$) were measured in one area of the lakes, but under similar conditions in another area there was no measureable release of phosphorus from sediments.

The spatial variability of phosphorus release rates from lake sediments was found to relate to variations in sediment redox potential and the level of total phosphorus in the sediment. The release of phosphorus from sediments under anoxic conditions can be controlled by an appropriate management strategy.

ORGANIC-MATTER BREAKDOWN IN THE WATERCOLUMN OF BILLABONGS.

Paul I. Boon. Murray-Darling Freshwater Research Centre, P.O. Box 921. Albury. N.S.W. 2640. Australia.

Exoenzyme activity in the water column of five billabongs was measured over the period 1987 to 1989. A range of water-quality characteristics (nutrient chemistry, physical parameters, microbial populations) was also examined to determine relationships between exoenzyme activity and environmental conditions. Aminopeptidase was the most active exoenzyme (9-1134 $\mu mol\ l^{-1}\ d^{-1}$), followed by alkaline phosphatase (4-222 $\mu mol\ l^{-1}\ d^{-1}$), lipase (<12 $\mu mol\ l^{-1}\ d^{-1}$), various gluco- and galactosidases (<6 $\mu mol\ l^{-1}\ d^{-1}$) and endopeptidase (<3 $\mu mol\ l^{-1}\ d^{-1}$). Activity was usually greater in billabongs than in rivers or lakes, but there was considerable spatial and temporal variability. Most exoenzyme activity was associated with particles. Very few systems conformed to the Michaelis-Menten model, suggesting that a number of exoenzymes were simultaneously active in degrading a single substrate. A close relationship was detected between aminopeptidase activity, phytoplankton abundance, bacterial numbers, and concentrations of free amino acids and ammonium. There were few clear relationships between alkaline phosphatase activity and environmental conditions.

Over-summering refuges of aquatic macroinvertebrates in two Victorian intermittent streams.

Andrew Boulton, Department of Zoology, University of Adelaide, Box 498, G.P.O., Adelaide, South Australia 5001.

Eight potential over-summering refuges for aquatic macroinvertebrates in two intermittent streams in central Victoria were sampled during the summers of 1982-84. Ninety-one taxa, mostly insects, were recorded. Receding pools harboured almost three-quarters of these taxa; comparatively few were collected from the hyporheos or from water in crayfish burrows. Amost half the taxa were found in refuges that did not hold free water, including decomposing wood - a refuge not considered in previous studies of over-summering strategies.
There was considerable overlap in broad taxonomic representation between refuges described for intermittent streams in southern Ontario and those sampled in this study.

Heat Uptake and Resistance to Mixing in Small Dystrophic Forest Lakes.

L.C. Bowling, N.S.W. Dept. of Water Resources, P.O. Box 3720, Parramatta, N.S.W. 2150.

Annual heat budgets, Schmidt thermal stabilities, and Birge's work of the wind in five small humic forest lakes from western Tasmania and five from southern Finland are compared and contrasted. Values for the Tasmanian lakes were lower than expected for lakes of their size, while the stability and wind work values of the Finnish lakes were also low. However their annual heat budgets were greater, due possibly to the input of latent heat of fusion required to melt their winter ice cover. Maximum values of the three parameters are controlled chiefly by morphometric features, but the degree of shelter and of dystrophy also have considerable effects. These two factors prevent deep mixing and thus distribution of heat, so mainly surface waters are involved in determining heat budgets, stabilities, and wind work values.

LIMNOLOGY AND WATER POLLUTION

A presentation of current projects at CSIRO Division of Water Resources by Kath Bowmer

CSIRO Division of Water Resources, Griffith Laboratory
Private Bag No.3, Griffith NSW 2680

The projects:

- management of aquatic weeds
- wetlands and water quality
- odours and toxins in surface water

MECHANISMS FOR MAINTAINING PERSISTENT POPULATIONS OF *MYRIOPHYLLUM VARIIFOLIUM* IN A FLUCTUATING SHALLOW LAKE.

Margaret A. Brock,
Botany Department, University of New England, Armidale. NSW

Plant populations in many shallow Australian lakes are subject to wide fluctuations of environmental factors such as drying and rewetting of habitats seasonally or aseasonally. This paper examines life-cycle and reproductive flexibility and exchange of reproductive material between habitats as means of maintaining persistent populations of the same species in different habitats.

In a shallow lake *Myriophyllum variifolium* grows in both temporary and permanent water habitats separated by a zone of open water. Established plants in these two habitats differ in growth-form yet both produce both asexual and sexual propagules. Field experiments and observations on the germination, growth and reproduction of this species demonstrate that the populations of established plants in both habitats have means of contributing to the establishment of new plants in either habitat. Such flexibility of life-cycle pattern and plasticity of growth form enhance survival in these widely fluctuating environments.

ECOLOGICAL SIGNIFICANCE OF STREAMFLOW PATTERNS OF SOME AUSTRALIAN RIVERS

Bunn, S.E. and Boughton, W.C., Division of Australian Environmental Studies, Griffith University, Brisbane, Australia

The pattern of stream discharge is known to exert a major influence on the structure and functional organization of stream benthic communities. In particular, discharge-related disturbance can be responsible not only for major variations in spatial and temporal patterns in community structure, but also have a major impact on productivity, nutrient spiralling and decomposition in streams.

The east coast of mainland Australia extends from 10° to 40° S latitude. Discharge data from a range of river systems along the east coast, and from the south-west of Western Australia, have been compared using Colwell's measures of time-series. This approach considers the overall predictability of discharge patterns, together with their contingency, which measures predictable fluctuations, and constancy.

Streams in the far north of eastern Australia show pronounced seasonal variation in flow from the tropical wet summers and dry winters, and have a high predictability and contingency. Streams in south-western Australia also show pronounced seasonal variation but with wet winters and dry summers. The degree of seasonality of stream discharge diminishes, however, as we move down the east coast. Streams in the south-east are more uniform in flow throughout the year because of the temperate climate and some snowmelt and in fact, show the least seasonal discharge pattern.

Most of our knowledge of the structure and functional organization of stream communities in Australia is based on studies conducted in the south-east. If stream discharge patterns are important in influencing benthic communities we should be careful not to make generalisations when this region is clearly atypical of most river systems in Australia.

The Toxicity of Chlorine and Monochloramine to Algae

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Australian Centre for Water Treatment and Water Quality
Research, PMB Salisbury Post Office, Salisbury, 5108.

Chlorination and chloramination are widely used for the disinfection of public water supplies. Monochloramine is more persistent than chlorine and consequently a residual of this disinfectant can more readily be achieved throughout extensive reticulation systems. There is some evidence that certain algae are resistant to concentrations of chloramine used for bacterial disinfection. Toxicity bioassays were carried out on a range of algae to assess their response to chlorine and chloramine. Different bioassay methods for assessing toxicity were evaluated - survival /regrowth, in vivo chlorophyll fluorescence. Of the algae tested, Chlorophytes and Euglenophytes were much more resistant to chlorine and chloramine than Cyanobacteria and coliform bacteria. Ecological implications of discharging chloraminated water to small reservoirs are discussed. This work is being carried out as part of an extensive evaluation of chloramination and has been supported by the Urban Water Research Association of Australia.

THE OCCURRENCE OF ORIENTAL WEATHER LOACH IN THE WINGECARRIBEE RIVER, NSW

J J Burchmore, F Faragher and G Thorncraft
Fisheries Research Institute, NSW Agriculture and Fisheries
PO Box 21, Cronulla, NSW, 2230

The Oriental Weather Loach Misgurnus anquillicaudatus (Family: Cobitadae) is native to Eastern Asia and has been exported to Australia and other countries as a cold water aquarium species. In January 1989 a feral population was found in the Wingecarribee River by the Sydney Water Board, this being the first occurrence of this species in NSW waters. NSW Agriculture and Fisheries subsequently decided to attempt an eradication of the population in February 1989. An initial survey indicated that the population was more widespread than originally thought. Nevertheless, it was decided to attempt to remove as many fish as possible before they spread. This was done using an ichthyocide, rotenone. Over the two day sampling period more than 600 Weather Loach were collected. Analysis of both Length-frequency and reproduction data indicates that the population is well established and reproducing in the river.
This study highlights the potential problem for fisheries managers in dealing with aquarium and other exotic fish releases.

THE OCCURRENCE OF ALGAL BLOOMS IN THE GIPPSLAND LAKES, VICTORIA

Button, B., Maher, W.A. and Bergman, I.D.
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The Gippsland Lakes in south-eastern Victoria are a series of coastal lagoons covering an area of some 250 square kilometres, with an artificial opening to the sea at Lakes Entrance.
The lakes have experienced eutrophic conditions on numerous occasions this century, and for several months in early 1988 a bloom of the Cyano bacteriales Nodularia spumigena (blue-green algae) covered most of the lakes system.
This poster shows the impact of the bloom on the lakes ecology and the recreational amenity of the area. Water-based activities such as swimming and sailing were severely restricted, beaches and inlets were choked with algae and there were numerous large fish-kills. Many local residents intend leaving the area and the direct loss of business related to tourism has been estimated at several million dollars.
The poster utilises Landsat Multi-Spectral Scanner Imagery to illustrate the origin and extent of the 1988 bloom, and to compare this with previous years. The remarkedly high incidence of cloud-free cover during early 1988 suggests above average sunlight hours and warmer water temperatures were conditions conducive to the occurrence of blooms.

ENVIRONMENTAL STUDY OF THE BJELKE-PETERSEN DAM PRE-CLOSURE SALINITY VARIATIONS IN BARKERS-BARAMBAH CREEK

B M Bycroft, A H Arthington & D L Conrick, Griffith University, NATHAN QLD 4111

Deterioration of water quality due to land degradation and agricultural practices is a significant environmental problem in Australia. One important consequence of land degradation is an increase in stream salinity levels. As part of a study investigating environmental aspects of the Bjelke-Petersen Dam near Murgon, Queensland, water quality data collected prior to the dam's completion have been interpreted with regard to their effect on stream salinity. In this paper emphasis is placed on the quality of stream water for irrigation, this being a major beneficial use of the water to be provided by the dam. Predictions are made with respect to salinity changes which may occur as a consequence of the dam's completion and the impoundment of stream water. Management options are also discussed.

Environmental Magnetism in Sedimentation and Sediment Tracing Studies

G. Caitcheon H. Crockford
CSIRO – Division of Water Resources, GPO Box 1666, Canberra

Magnetic minerals found in the sediments of natural lakes and man–made reservoirs may be used to develop correlations between cores and in sediment source tracing. Environmental studies in the U.K. have made use of naturally occurring magnetic minerals in soils and sediments to document past environmental conditions within lake–catchment ecosystems. Attempts to apply similar methodology in Australia have been less successful due to significantly different environmental conditions. However, under circumstances which are now being better understood, the use of magnetic minerals provides a relatively rapid and inexpensive method for developing and testing correlations within lacustrine systems and, where lithological differences are significant, establishing sediment–source links.

CHAROPHYTE RESPONSES TO CHANGES IN WATER LEVELS

M.T. Casanova.
Botany Dept. University of New England Armidale 2351.

The life cycle patterns of two species of Characeae from ephemeral habitats on the Northern Tablelands of New South Wales are compared.

Chara corallina experiences 5% germination from a reflooded dry seed bank, has a high rate of establishment, responds to a decrease in water level by initiating sexual reproduction and is perennial when water levels are stable.

Nitella subtilissima has 13% germination, experiences high mortality in the establishment phase and did not respond to water level changes by initiating reproduction. It appears to be a strict annual even when water levels are stable.

The implications of these results for management and understanding of wetlands are discussed.

THE SEX LIFE (OR LACK OF IT) OF AN OSTRACOD

J A Chaplin, University of Wollongong;
Murray-Darling Freshwater Research Centre

Evolutionary theory predicts that sexually reproducing individuals should have a selective advantage in unstable environments. In order to provide a test of this prediction, genetic and sex ratio data were used to determine the mode of reproduction of populations of the freshwater ostracod Candonocypris novaezelandiae in both stable and unstable water bodies.

Most of the populations sampled relied upon asexual reproduction, regardless of the size or degree of permanency of the water body they inhabit. The only populations for which there was evidence that sexual reproduction was most important resided in a large permanent lake in southern Victoria and in a large temporary swamp in WA. The results suggest that it is unlikely that habitat stability controls the mode of reproduction.

ESTIMATING CATCHMENT PHOSPHORUS EXPORT USING A UNIT RUNOFF COEFFICIENT

PHILLIP R. COSSER
Division Australian Environmental Studies, Griffith University, Q. 4111.

Unit area export (kg km^{-2} yr^{-1})is determined to a considerable extent by discharge. Consequently, in regions where discharge is highly variable the value of the unit area export coefficient for a given catchment will also be subject to marked annual variation. The coefficient is therefore relevant to the year of measurement only. However, by expressing load in terms of mass per unit runoff per unit area (kg mm^{-1} km^{-2}), variance attributable to discharge is removed. Unit runoff coefficients were determined for stormflow and baseflow discharge regimes during a two year study of the South Pine R. Coefficient values were constant during baseflow, and relatively constant over the three major storm events (0.460 - 0.539 kg mm^{-1} km^{-2}). This constancy has potentially significant implications for load estimation, as by using the coefficients in conjunction with discharge data stratified by flow regime, reliable estimation is possible. Once measured, the coefficients can be used to estimate both historical and current load directly from the flow record.

DIEL VERTICAL MIGRATION IN SHALLOW PONDS WITHOUT FISH PREDATION.

GERALDINE DAVIS Department of Botany & Zoology, Monash University.

Diel vertical migration in shallow ponds was investigated at two localities, one with high invertebrate predator densities and the other with low densities. Vertical migration was found to occur in several taxa, despite the fact that the ponds were homogeneous with respect to food and physico-chemical parameters. In particular there were reciprocal migration patterns between *Daphnia* and notonectids at the given sites.

The occurence of vertical migration in these ponds casts doubt on the universality of the (visual) predator avoidance hypothesis. Hypotheses involving interactions with invertebrate predators (ie. non-visual predators) or genetically fixed behaviour are proposed as possible explanations for this phenomenon.

THE ROLE OF NEARBED FLOW REGIMES IN DETERMINING THE PATCHINESS OF STREAM BENTHOS

Davis, J.A. and Growns, I.O. School of Biological and Environmental Sciences, Murdoch University, Murdoch, Western Australia 6150.

A classification system for nearbed flows in streams and rivers recently proposed by one of us (Davis) and colleague Leon Barmuta, enables the "patches" within the flow regimes associated with the streambed to be identified. These patches in turn may play an important role in determining the spatial heterogeneity of stream benthos. Measurements of nearbed flows in streams in south-western Western Australia and a benthic sampling programme were undertaken in January 1989 to determine (a) the spatial heterogeneity of flow microenvironments associated with the streambed at selected sites; and (b) the extent to which the different flow microenvironments influence benthic micro-distribution.

NUTRIENT LIMITATION OF PERIPHYTON GROWTH IN EIGHT VICTORIAN STREAMS

Bruce C. Chessman and Primrose E. Hutton
Environment Protection Authority, Victoria

Nutrient-diffusing artificial substrata were used to assess limiting nutrients for periphyton growth and nutrient effects on algal species composition and invertebrate colonisation. Streams in urban, agricultural, forested and sub-alpine areas were studied. Chlorophyll a density was primarily limited by nitrogen in most cases; often phosphorus was secondarily limiting. One alpine, one forested and one agricultural stream were primarily phosphorus limited in at least one season. Added trace elements and vitamins did not stimulate chlorophyll density. Diatom and invertebrate assemblages generally did not differ greatly between various nutrient enrichments.

FISH-INVERTEBRATE INTERACTIONS IN AN INTERMITTENT STREAM. Gerard Closs. Department of Botany & Zoology. Monash University, Clayton, 3168, Vic.

A fish (*Galaxias olidus*) enclosure/exclosure experiment was carried out during a non-flow period in the Lerderderg R. Both shallow and deep water habitats were incorporated into the cage design. After three weeks, three taxa, *Culex sp.*, *Sternopriscus multimaculatus* & *Cura pinguis* responded negatively to the presence of fish. Five taxa, four trichopterans & one snail responded positively. For most of the species analysed, physico-chemical factors appeared to have determined distribution irrespective of fish.

SOME AUSTRALIAN PSAMMOPHILIC CHIRONOMIDAE

Peter S. Cranston,
ANIC, CSIRO Division of Entomology,
PO Box 1700, ACT 2601

Investigations of the chironomid fauna of lotic systems in south-eastern Australia and in the Alligator Rivers region of Northern Territory are revealing several hitherto little known or previously unrecorded genera. The larvae of many of these taxa appear to be predominantly psammophilic, living in unstable sandy substrates. Included amongst them are the Tanypodinae genera *Djalmabatista* and *Nilotanypus* and the Chironominae *Robackia* and *Skuselia*.

Djalmabatista, clearly related to *Procladius*, seems to be a Gondwanan taxon, speciose in the Neotropics, with limited species in the southern Nearctic and southern China. *Nilotanypus* and *Robackia* are probably world-wide genera. *Skuselia*, whose immature stages are described for the first time here, shows an interesting distribution from west Africa through India to Australia.

The larvae and pupae of Australian representatives of the four taxa are illustrated in a poster.

Chemical pest control in our forests: what cost on streams?

P.E. Davies, Inland Fisheries Commission, Tasmania, 7000.

Chemical methods for the control of two principal pest problems in plantation forestry in south eastern Australia have the potential for major local impacts on stream ecosystems. Initial results of field studies on the effects of aerial spraying of atrazine/amitrole and cypermethrin in pine and eucalypt plantations on stream fauna are described. Changes in fish populations, benthic invertebrate densities and drift fauna were examined along with a range of fish physiological parameters. In both studies, direct contact occurred between spray and stream water surfaces. Contamination with the pyrethroid cypermethrin essentially eliminated invertebrate fauna, massive drift of dying organisms occurring within 2 hrs of spraying. Secondary mortality and physiological stress occurred in brown trout after several days of feeding on drifting organisms. Spraying with atrazine caused minor effects on invertebrate drift. The brown trout population at the stream site most affected by direct drift contamination exhibited enhanced emmigration and immigration in the first 14 days post-spray, associated with minor physiological disturbance.

LIMNOLOGY AND FUTURE CLIMATIC CHANGE UNDER THE GREENHOUSE EFFECT "SCHEME". A NEED TO GO BACK TO PALAEOLAKES AND PALAEORIVERS

Patrick DE DECKKER Department of Geology, ANU, GPO Box 4, Canberra ACT 2601.

There is considerable concern about the predictions of a future climatic change that is going to affect the entire globe. Naturally, several regions are to register the effects of climatic change in a more pronounced way than others; some regions will witness a dramatic change in rainfall, others will become much more arid. Groundwater aquifers are also going to be affected.

It is the role of the limnologist to assess the likely changes that are to occur in aquatic systems in Australia under the prospect of a climatic change. Obviously, in order to attempt answering the abovementioned question, limnologists will have to seek collaboration from people from other disciplines (viz. climatology, hydrology, pedology ..) to get a better data set. Limnologists will have to ask questions never raised before by them. One of the major questions will have to be: "What is the equilibrium between a particular waterbody and the atmosphere above it, and the climate affecting it?"

I propose that looking at the past record of lakes, rivers and groundwaters will help answer these issues by simply attempting to look at past analogues of conditions similar to those that are to occur in the near future. **The past is the key to the future**, and palaeolimnological investigations should guide us towards a better management of the aquatic environment.

THE CONTRIBUTION OF DRIFT TO MACROINVERTEBRATE COLONIZATION OF SAND, ROCKS AND GRAVEL

T.J. Doeg, P.S. Lake and M. Douglas (Zoology Department, Monash University, Clayton 3168) and R. Marchant (Department of Invertebrate Survey, Museum of Victoria, Abbotsford 3067).

The contribution of drift to macroinvertebrate colonization was studied over 10 days using pairs of substratum-filled trays, one suspended above, and one buried flush with the streambed. Trays were filled with sand, gravel or stones. Colonization of sand trays was rapid, being completed within 24 hours, so the contribution of drift to the colonization could not be accurately evaluated. Drift contributed an average of 36% of the fauna of the gravel-filled trays and 25% of the fauna of the stone-filled trays. This low contribution is at odds with some studies which, using similar techniques, suggests that drift is the primary source of colonizing individuals.

Fractionation and characterization of suspended particulate matter (SPM) in the Murray–Darling River system. G. Douglas, Centre for Stream Ecology, Chisholm Institute of Technology.

It is now well established that suspended particulate matter (SPM) plays a significant role in the transport and fate of trace metals, nutrients and other contaminants in aquatic systems. A new technique universally applicable to a wide range of natural waters has been developed to collect and fractionate SPM encompassing the pariculate and colloidal (< 1 micron) size ranges. The application of this fractionation technique to the Murray–Darling River system and methods of physically and chemically characterizing the fractionated SPM will be discussed.

DOWNES, BARBARA J. & P.S. LAKE. Centre for Stream Ecology, Dept. of Botany & Zoology, Monash Univ., Clayton Vic. 3168. Factors affecting colonization of disturbed rocks by blackflies.

In many places, blackfly larvae rapidly colonize newly-scoured surfaces, with numbers declining as other species increase. Whether these responses are due to other species or to surface characteristics of rocks has not usually been tested. In the Acheron River, blackflies colonized bricks quickly and more abundantly than scoured river rocks. Bricks did not differ in numbers of other species, suggesting that blackflies respond mainly to surface characteristics of the substrate. However, experiments in which blackflies were offered scoured bricks, bricks with no animals and controls suggested that blackflies do not respond simply to surface characteristics. Instead, settlement choices vary over different spatial scales, are markedly affected by current velocity, and differ between blackfly species. Our results echo recent calls for more sophisticated models in stream ecology.

LOW LEVEL (ppb) DETERMINATION OF ORTHOPHOSPHATE BY FORMATION OF REDUCED MOLYBDOANTIMONYLPHOSPHORIC ACID WITH ASCORBIC ACID REDUCTANT

LINDA DRUMMOND and WILLIAM MAHER
WATER RESEARCH CENTRE, CANBERRA COLLEGE OF ADVANCED EDUCATION

The formation conditions for reduced molybdoantimonylphosphoric acid were investigated and optimised for application to the automated real time analysis of phosphorus at the 0 - 100 $\mu g\ l^{-1}$ (P) level. The factors affecting the analysis were optimised for speed of reaction, and to obtain maximum sensitivity and the highest precision of both the blank and the sample. At high pH^{+} (>1.0), the level of the blank was unacceptably high as a result of direct reduction of Mo(VI) to Mo(V) in the absence of phosphate. At pH <1.0 the fastest reaction time and the highest level of precision of both the blank and the sample were achieved with a $H^{+}/MoO_4^{=}$ ratio of 70, pH 0.76, an ascorbic acid concentration 3000 times the maximum phosphorus level present and an antimony concentration 20 times the maximum phosphorus level present. The fastest reaction time for a 100 $\mu g\ l^{-1}$ (P) sample was 0.8 min (CV<1%) and the fastest time for equilibration of the blank was 3 min (CV<10%).

BACTERIVORY BY A DEPOSIT-FEEDING MAYFLY

Rick T Edwards and Judy L Meyer
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Caulfield East, Victoria and
Institute of Ecology, U of Georgia, Athens, GA, USA

The transfer of carbon through the microbial trophic loop into stream macroinvertebrates has been investigated in a coastal blackwater river in southeastern USA. Bacteria have been shown to be unimportant in the diet of a shredding isopod Lirceus sp. but of great importance to a filter-feeding insect Simuliium sp. We report an experiment to determine the importance of bacterivory to the diet of a larval insect with a different feeding strategy, the deposit feeding mayfly Stenonema sp. Stenonema inhabit the surface of snags where they feed on accumulated seston deposits. By radiolabelling DNA of bacteria in seston we estimated rates of incorporation of bacterial biomass into larval tissues. Larvae incorporated bacterial biomass equivalent to 93% of their daily growth increment. Comparing assimilation of bacteria to the total carbon needs of the animal (growth + respiration) we estimated that larval Stenonema incorporate bacterial biomass equivalent to 46% of their total daily carbon needs.

DUCKWEEDS AS TOXICOLOGICAL TEST SPECIES

I W Eskdale & R T Buckney
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Technology, Sydney; PO Box 123,
Broadway NSW 2007

Duckweeds (family Lemnaceae) may be used where laboratory and field bioassays are required to establish the responses of higher aquatic plants to chemicals in water. Two strains each of Lemna minor L. and Spirodela oligorrhiza (Kurz) Hegelm. isolated from the Sydney area have been established in pure culture. The laboratory evaluation of their responses to a number of chemicals is described.

Characterization of Cyanobacterial Toxins

Dianne Flett
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A toxic strain of the cyanobacterium *Microcystis aeruginosa* blooms in Mount Bold Reservoir, South Australia, and is lethal to mice at a dose of 10 mg/kg (intraperitoneal injection). A technique using High Performance Liquid Chromatography, has been developed to qualitatively and quantitatively determine toxin content. This has revealed variations in toxin content between and within strains of *M.aeruginosa*.

This work is funded by the Urban Water Research Association of Australia and is part of research into algal toxins in water supplies.

IDENTIFICATION OF THE SOURCES OF SEDIMENTS ENTERING LAKE BURRAGORANG

D. Fredericks
CSIRO Division of Water Resources, GPO Box 1666, Canberra, ACT 2601

The New South Wales Soil Conservation Service (SCS) and the Sydney Water Board have been involved in schemes designed to preserve water quality in Lake Burragorang for the last 25 years. The principal role of the SCS is the control of turbidity levels by the promotion of good land management practices within the catchment and by the construction of structural works. Identification of the major sources of suspended sediment in a catchment as large and as diverse as that of Lake Burragorang is not a simple procedure. To this end the SCS and CSIRO have instituted a research program investigating the generation and transportation of suspended sediment within the catchment. The origins of sediments trapped by Lake Burragorang can be identified using a combination of different tracing techniques and simple geomorphological methods. Preliminary data will be presented which identify the major sources of sediments in the catchment; these also show that a combination of techniques gives the most information on sediment sources as well as the greatest confidence in the identification of these sources.

THE ENDANGERED SPECIES CONCEPT ; ARE FRESHWATER INVERTEBRATES READY FOR IT ?

Wayne Fulton, Inland Fisheries Commission, Tasmania.

With the recent increase in awareness of environmental issues and their subsequent politicisation, the tag of 'Endangered Species' has become a central issue in many debates. Consequently, the need for accuracy in published lists is heightened by their availability for use and interpretation in whatever context is deemed appropriate at the time.

Certain elements of Tasmania's freshwater fauna are undoubtedly under threat. However, the information necessary to adequately describe this fauna and map its distribution is not available for all but freshwater fish and a few select invertebrate groups.

The principle endangered species lists that have been published for Tasmania's freshwater invertebrates are discussed in the light of information collected in survey work undertaken by the Inland Fisheries Commision and a degree of caution is suggested to limnologists should they be considering the compilation of further lists for any area.

INVESTIGATIONS OF THE LITTORAL ROCK FAUNA OF TASMANIA'S NATURAL LAKES

Wayne Fulton and Stuart J. Chilcott, Inland Fisheries Commission, Tasmania.

The project began in 1986 with the collection of littoral rock fauna and freshwater fish samples from several of Tasmania's alpine lakes. Work continued and expanded with the assistance of specific grants to the stage where collections have now been made from over 120 natural lakes, a large proportion of which had not previously been sampled for freshwater fauna. These include sites in most of the 'systems' of alpine lakes throughout the State, particularly in the Western Tasmania World Heritage Area.

Details of the surveys are presented. The freshwater invertebrate collections have added considerably to our distributional knowledge and represent valuable reference collections for future taxonomic work. The faunal information, along with water quality and physical data, have been subjected to multivariate analysis to examine relationships between the fauna of the various lake 'systems'.

Can River Murray Crayfish (Euastacus armatus) be restocked in the South Australian section of the River Murray?

Michael Geddes, River Murray Laboratory, Zoology Department, University of Adelaide, Box 498, G.P.O., Adelaide, South Australia 5001.

River Murray Crayfish are said to be extinct or nearly so in the South Australian stretch of the River Murray. This study examines the feasibility of restocking crayfish via experiments which involve holding crayfish in cages in the river, examining environmental tolerances of crayfish in the laboratory and evaluating hatchery procedure for the production of juvenile crayfish.

Caged crayfish downstream from Lock 3 survived and grew in a flowing section of the river but failed to survive in the pool above the Lock. Juvenile crayfish tolerated high temperatures to 28°C, low oxygen to about 2.5 ppm and salinities to more than 15°/oo. Berried females produced young that have been grown for six months in above ground swimming pools. To date breeding trials in outdoor fibreglass tanks have not been successful.

Environmental gradients influence temporal and spatial dispersion patterns of native fish larvae.

Peter Gehrke. NSW Agriculture & Fisheries, Inland Fisheries Research Station, P.O. Box 182, Narrandera 2700.

Larval silver perch and golden perch were exposed to gradients of light, depth, flow, and wood. Both species were attracted to light and were carried downstream by the flow. but neither responded to depth. Golden perch larvae were attracted to river red gum timber in the water but silver perch larvae did not respond to wood at all, suggesting that adult habitat preferences for woody cover in golden perch, and relatively open water in silver perch, are established early in larval development. In an artificial floodplain wetland, golden perch larvae actively avoided shade, wood and flow stations, preferring instead inundated grasses near the banks of a deeper pond section where water was warmer and contained more oxygen. While larvae can detect gradients which may lead them into protected, nutrient-rich wetlands, they can also discrininate between habitat types and will avoid so-called nursery areas if water quality is not suitable.

Engineering Bridges between Hydrology and Stream Ecology

Nancy D. Gordon, Tom A. McMahon and Brian L. Finlayson (Centre for Environmental Applied Hydrology, University of Melbourne, Parkville, Victoria 3052)

Increasingly, interdisciplinary approaches are required for solution of land and water management problems. The Centre for Environmental Applied Hydrology is Australia's first interdisciplinary research centre bridging the interface between the physically-based fields of engineering hydrology and fluvial geomorphology and the biologically-based fields of aquatic biology and stream ecology. As part of the Centre's core programme, a "user-friendly" manual is being written, with a supplementary computer package, so that hydrologic and hydraulic techniques can be more easily accessed and applied by biologists. Contents will include sampling strategies, sources of data, geomorphic/hydrologic classification of streams, fluid mechanics and fluvial geomorphology, field techniques, data analysis (flow duration curves, flood frequency, etc.), and extrapolation of runoff data from gauged to ungauged sites.

Future directions in technology transfer will be influenced by reviews of the current work. Field and "desk" workshops, development of computer-assisted tutorials, and the "user-friendlyizing" of more advanced techniques such as time series analysis and rainfall-runoff modelling are possibilities.

NOT ALL WETLANDS ARE EQUAL - DIFFERENCES IN CHIRONOMID POPULATIONS IN PERTH'S URBAN WETLANDS

SUE HARRINGTON, ADRIAN PINDER AND JENNY DAVIS
School of Biological and Environmental Sciences
Murdoch University, Murdoch, W.A. 6150.

Populations of larval chironomids in 4 urban wetlands were sampled over the spring and summer of 1987/88. The wetlands showed differences in chironomid abundance and species composition and local residents complained of varying levels of nuisance caused by adult midges. Two wetlands were sampled for a further year and clear contrasts between chironomid populations in temporary and permanent wetlands were found. Urbanization, nutrient inputs and pesticide applications appear to influence the population structure. The application of these results to control programmes is discussed.

Geographic variation in some population parameters of the freshwater crayfish *Euastacus bispinosus*.

Jodie A. Hoey, Faculty of Applied Science and Technology, Warrnambool Institute of Advanced Education, PO Box 423, Warrnambool 3280.

The freshwater crayfish *Euastacus bispinosus* has been considered as invariable throughout its geographic range. However comparison of populations in South Australia and Victoria, indicates population differences. The South Australian population has a smaller size at sexual maturity, less synchronised breeding, a high incidence of gonopore abnormalities and a different pattern of female allometry. The environmental conditions which may have caused these differences are considered.

THE AUSTRALIAN BIOLOGICAL RESOURCES STUDY

W W K Houston and Pam Beesley
ABRS, Canberra, ACT

An objective of the Australian Biological Resources Study (ABRS) is to stimulate research and publications on the taxonomy and distribution of Australian fauna and flora. ABRS also provides advice to the Commonwealth on national taxonomic collections, establishes and maintains taxonomic databases, co-ordinates vegetation mapping, and publishes flora and fauna handbooks. Much of the research and documentation of work for the ABRS is by staff of museums, herbaria, CSIRO and universities. Research is funded through the Participatory Programs Grants Scheme. ABRS is an excellent example of co-operation between the Commonwealth, States and the scientific community.

Major national series published by ABRS include:
- The Fauna of Australia: 10 vols
- The Zoological Catalogue of Australia: Approx 70 vols
- The Flora of Australia: Approx 60 vols

Other projects being undertaken by ABRS include:
- The Australian Plant Name Index
- Census of Australian Plants (CAP)
- Census of Australian Vertebrate Species (CAVS)
- The Australian Flora and Fauna Series
- Australian Biogeographic Information system (ABIS)
- Register of Taxonomists and Biogeographers

LEAF BREAKDOWN RATES IN CLEARED AND FORESTED STREAMS

Kim James and Ian Campbell. Centre for Stream Ecology, Chisholm Institute of Technology, Victoria 3145.

Keppels Creek and the Loch River, two upland streams about 100 km NE of Melbourne, were selected as study sites for a comparison of leaf breakdown rates in streams flowing through the bush and land cleared for grazing. The bush and farm sites on these streams are about 3 km apart with the farm site downstream from the bush site. Fresh and abscissed leaves of *Acacia melanoxylon* (Blackwood wattle), *Blechnum nudum* (Water fern), *Correa lawrenciana* (Mountain *Correa*), *Eucalyptus viminalis* (Manna gum) and *Pomaderris aspera* (Hazel *Pomaderris*) were tested. Five gram leaf packs of these species were placed at all sites during summer and winter for two years. Fresh leaves were broken down faster than abscissed leaves in all species tested. Both fresh and abscissed leaves of *E. viminalis* and fresh leaves of *P. aspera* were reduced to around 25% of their starting weight within 6-8 weeks; abscissed leaves of *P. aspera* took several weeks longer. Fresh and abscissed leaves of *C. lawrenciana* were broken down over 8-10 weeks whilst leaves of *A. melanoxylon* and *B. nudum* took up to six months. Packs were broken down at the same rates in the bush and farm sites at the Loch River whereas they were broken down faster in the farm site than the bush site at Keppels Creek. The breakdown rates in the farm sites of both rivers were very similar. There were no consistent differences in breakdown rates between summer and winter.

The Distribution of Fish Fauna in the Otways, Victoria

John Koehn

Eighteen fish species: 14 native and 4 introduced have been recorded from the Otways. Distributions cannot entirely be explained by habitat availability, but appear to be related to previous geomorphic conditions. The fish fauna in the coastal streams east of Cape Otway consists entirely of species with marine life phases. Species which have entirely freshwater lifecycles, are absent from these streams despite being abundant in the Gellibrand and Barwon River systems which surround this area. It is postulated that the fish fauna of the coastal streams is entirely due to recolonization from the sea as this area formed part of the Bass Strait land bridge during the last ice-age.

Comparisons are made between the fish fauna of this region and Northern Tasmania. The major change in fish fauna during the past 100 years has been the introduction of trout.

The Otway region is considered an important conservation area for many species and populations.

THE PHOTOTACTIC BEHAVIOUR OF Tanytarsus barbitarsis Freeman (Diptera:Chironomidae)

M.J. Kokkinn

School of Pharmacy, South Australian Institute of Technology, North Terrace, Adealiade, S.A. 5001.

The chironomid midge, Tanytarsus barbitarsis is frequently a nuisance by virtue of its strong attraction to artificial light. A series of experiments to investigate the spectral preference of T. barbitarsis was undertaken with a view to developing control methods. Results revealed two regions of preference: 370 - 400nm (unltraviolet) and 490 - 510nm (blue-green). Control measures include using decoy lights (Clear Mercury and Sodium High Pressure) and applying plastic film to windows and outdoor lights to limit the emission of ultraviolet light. The phototactic behaviour of insects and aquatic insects in particular is discussed.

MICROHABITAT SPECIFICITY OF MACROINVERTEBRATES OF THE RIVER MURRAY, OVERLAND CORNER, SOUTH AUSTRALIA

L N Lloyd & K F Walker
River Murray Laboratory, Dept Zoology, University of Adelaide

This talk considers whether macroinvertebrates display any microhabitat specificity in the lower River Murray. The microhabitats sampled included snags (woody debris; in both river and backwater), sediments (sand, silt & limestone rubble), aquatic vegetation (submerged, floating & emergent) and open water (in both river and backwater). Each microhabitat was sampled with a standard method between sites but differences in physical structure necessitated different sampling techniques for each class of microhabitats. Preliminary data indicate that only aquatic vegetation and submerged wood support large and diverse macroinvertebrate communities. Using cluster analysis, non-metric multidimensional scaling and principal components analysis it is clear that the three types of microhabitats support distinctive invertebrate communities.

DEFORMITIES IN CHIRONOMID LARVAE ASSOCIATED WITH EXPOSURE TO PESTICIDES.

Chris Madden (Centre for Environmental Studies, University of Adelaide)

Deformities in chironomid larvae have been reported from polluted waters in North America, Europe and Australia. In most cases only a correlation between the presence of pesticide, heavy metal or radioactive pollution and the presence of deformed chironomids was reported. The results of laboratory experiments designed to test if deformities can be induced by exposure to pesticides will be presented. Other experiments that investigated a possible mechanism by which the deformities are produced will also be discussed.

POLYCYCLIC AROMATIC HYDROCARBONS IN THE SEDIMENT OF LAKE BURLEY GRIFFIN, CANBERRA

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Water Research Centre
School of Applied Science
Canberra College of Advanced Education
PO Box 1
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Polycyclic aromatic hydrocarbons (PAH) are of general concern as they are known to be highly carcinogenic and mutagenic. Sublethal levels are suspected of causing chronic disturbances of aquatic ecosystems. PAH are known to enter waterbodies through industrial discharges and non point sources such as runoff. To define water quality criteria and to develop catchment management strategies, information is needed about PAH sources and loads entering waterbodies and cycling within the water column.

This paper discusses the results of a study in which sediment samples from 20 sites within Lake Burley Griffin were collected, and the concentrations of eleven non-alklyated PAH determined. Sediments obtained by the use of a grab were freeze dried, soxhlet extracted with dichloromethane and the PAH quantified by HPLC. Identification of the individual PAH were confirmed using GC-MS in selective ion mode. Concentration of PAH measured were generally below 100ug/kg these levels being well above those reported for pristine environments. Results will be discussed in relation to other published studies and possible sources postulated.

RELEASE OF A MINE WASTE WATER INTO A TROPICAL BACKFLOW BILLABONG.

Michael M. Mannion. Office of the Supervising Scientist for the Alligator Rivers Region, Alligator Rivers Region Research Institute,Jabiru. N.T. 0886. [poster presentation]

Djalkmara Billabong lies adjacent to the Magela Creek and the Ranger Uranium Mine in the Kakadu National Park, and is a backfilling billabong with a small catchment. During February and March of 1989, Ranger released impounded runoff water from their waste rock dump into this billabong via a drainage channel. The movement of this water through the billabong was monitored by undertaking conductivity measurements. These conductivity values have been used to map the consequent distribution of mine waters during and after backflow events. High conductivities were detected in surface waters of the upper and middle billabong 20hrs and 24hrs after the initial release began. These waters however were not detectable at the confluence till after 4 days. During the first release the mine waters demonstrated a preference for the western side of the billabong (channeling) which was disrupted during backfilling. Three more backflow events occurred during the second release resulting in changes to water distribution and sandbar formation. Elevated conductivities were still evident throughout the billabong 91 days after the initial release.

THE ROBUSTNESS OF CLASSIFICATION AND ORDINATION TECHNIQUES APPLIED TO MACROINVERTEBRATE COMMUNITIES IN VICTORIAN STREAMS

R.Marchant & B.C.Chessman, Museum of Victoria, 71 Victoria Cres., Abbotsford 3067 and EPA, Hazelwood Rd, Traralgon 3844.

We are currently engaged in a project to classify Victorian streams according to their macroinvertebrate communities using ordination (DECORANA) and classification (TWINSPAN) techniques. Before attempting a state-wide analysis we have investigated the robustness of site groupings produced by these techniques to variations in the quality of the raw data using an extensive data set from the La Trobe catchment. Ordinations or classifications based on presence and absence of taxa or on relative abundance of taxa are not substantially different from those based on actual abundance values. However, when taxonomic discrimination is reduced from the the species or genus level to the family level distortions occur in the resulting ordinations and classifications. In addition, ordinations based on 10 replicates per sample are little different from those based on a sub-set of 4 or 5 of these replicates; however, the use of fewer replicates results in distortion.

VARIABLITY IN PHOSPHORUS/CHLOROPHYLL RELATIONSHIPS.

V.Martin, R.Norris and P.Cullen. Water Research Centre. Canberra College of Advanced Education. PO Box 1, Belconnen 2616.

Phosphorus has long been considered the main limiting nutrient of algae therefore controlling inputs of phosphorus is often the first step in reducing the effects of eutrophication. The effects of an increase or decrease in nutrient supply are often predicted using models derived from statistical correlations between nutrients and algae.

Although widely used, particularly in the Northern Hemisphere, these models can have considerable variability in predictions and may give unacceptable confidence limits. Variations may be caused by a number of factors unique to each reservoir such as turbidity levels, variations in mixed depths, N:P ratios, flow timing and flushing rates. Also, data for these models are often intended for other purposes so many do not meet assumptions of a model.

Turbid Australian reservoirs have been excluded in global analyses as these reservoirs show significant deviations from the regression equations. This study attempts to explain variations in phosphorus/chlorophyll relationships in selected N.S.W. reservoirs.

DIATOMS IN PALAEOLAKE SEDIMENTS ON MACQUARIE ISLAND

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ABSTRACT

The undulating, lake-dotted plateau of subantarctic Macquarie Island (54°S, 159°E) contains numerous sediment deposits which originated in former lakes. Well-preserved diatom frustules and other plant fossils are abundant in these deposits and their presence can be used to identify sediments of lacustrine origin. A study was made of the fossil diatoms in a lacustrine deposit located above the present Lake Skua at 180 m asl on the western rim of the plateau. These sediments apparently originated in a former, larger Palaeolake Skua which extended westwards beyond the present cliff line and was partially drained by cliff collapse following marine erosion. Diatom fossils representing at least 17 genera and 62 species have been identified. No marine taxa have been observed. Between the start of sediment accumulation at about 14,000 years ago and the draining of the lake, three different assemblages of diatoms were present. The changes in assemblage composition occurred at about 13,000 and 9,000 years ago and certainly signal changes in the environment of Palaeolake Skua at these times. However, further work on the fossil flora of the lake and the living diatom flora of the island will be necessary to deduce the nature of these environmental changes. Similar studies on the several other palaeolake sites may allow generalisations to be made for the whole island.

SALTWATER - AN ECOLOGICAL THREAT TO RIVER ENVIRONMENT

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The intrusion of saline water into a river environment may cause habitat degradation. Studies during 1988/89 have identified the extent of this problem in the Campaspe River downstream of Lake Eppalock. Salinity stratifications and associated severe deoxygenation of the water column occur at times of low discharge. This paper will review the nature of these problems and the effects of discharge events. This river is an example of salinity related problems expected to also occur in other northern Victorian rivers in salt affected areas.

BIOLOGICAL MONITORING OF THE WERRIBEE AND MARIBYRNONG RIVERS USING MACROINVERTEBRATES

LEON METZELING, WATER QUALITY ASSESSMENT SECTION, RURAL WATER COMMISSION

Three sites on the Werribee River and 4 on the Maribyrnong River were sampled for macroinvertebrates twice yearly for 3 years by the Rural Water Commission as part of the Environment Protection Authority's biological monitoring programme. Both catchments are close to Melbourne yet are largely rural, with some areas of intensive market gardening and rapidly growing urban centres. The benthic macroinvertebrate communities are described, and analysed using DECORANA and TWINSPAN, and their structure related to various environmental factors.

To be continued....

Musical Satues?

Leon Barmuta and Tim Doeg cross forks over the last drop of red

Queenslanders defying gravity, they say the banana skins are good up that way

The midges may have tooth deformities, but we don't!"- the W.A.team

"Ooh yes, I much prefer Macho-Geo's to Wimpo-Limno's"

The race to the bar as last orders is called

Mr. Jeans West meets the Rockabilly Rebel

Leon Barmuta, a worried looking Richard Marchant and the inimitable Tim Doeg (behind the custard tart)

"Quite big isn't it? I have to use megacondoms"

Ian Cambell practicing his latest karate technique on Nittaya Nugranad.

Leon (who?) strangling his parrot

.....Abstracts continued

SOURCING SEDIMENT USING ENVIRONMENTAL RADIOACTIVITY

All detrital sediment contains a variety of naturally occurring and/or man made radionuclides, including members of the uranium and thorium decay series, and Cs-137. We have found that the relationship between some of these nuclides, such as Ra-226 and Th-232, is characteristic of the catchment from which the material was eroded. Such relationships can be used quantitatively to estimate the relative importance through time of different spatial sources to the material composing a sediment profile. In addition, Cs-137 from bomb fallout in the 1960s labels sediment derived from surface soils of that period. Thus considerable information on the spatial and depth origins of sediment in the landscape is available from radionuclide studies of lake sediments.

A.S.Murray, J.M. Olley, P.W. Wallbrink, Division of Water Resources, CSIRO, P.O. 1666, CANBERRA, ACT 2601

Impact of an abandoned mine on an upland stream

Gillian M. Napier
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University of Technology, Sydney, PO Box 123 Broadway, N.S.W. 2007
Centre for Environmental Toxicology, State Pollution Control Commission and University of Technology, Sydney, PO Box 4036, Sydney N.S.W. 2001

The comparisons of some laboratory derived data on the toxicity of heavy metals, to the measurements and observations made at a stream affected by previous mining activity is discussed. Results from a survey conducted along Daylight Creek suggest that predictions from laboratory tests may not be always applicable to a natural aquatic system system.

The Pesticide, Endosulfan, and the Wee Waa Lagoons

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Centre for Environmental Toxicology, State Pollution Control Commission and University of Technology, Sydney, PO Box 4036, Sydney N.S.W. 2001

Results from the water analysis for three endosulfan residues have indicated measurable amounts of these residues from three of the Wee Waa lagoons surveyed and possibly trace amounts present in the control site during the spraying season. The USEPA (1986) criteria suggest for the protection of freshwater life, endosulfan concentrations should not exceed 0.056ug/l for a 24hr average and the concentration should not exceed 0.22ug/l at any time. Four of the samples have concentrations above the limits of the first criterion, two of which are actually above the 0.22ug/l limit. Assessment of the aquatic fauna for both population analysis and pesticide residues are also considered.

TRACE METALS IN LACUSTRINE SEDIMENTS; A CASE STUDY FROM THE GULF OF CARPENTARIA

M.D. NORMAN * & P. DE DECKKER **-------*Research School of Earth Sciences, **Dept. of Geology, The Australian National University,GPO Box 4, Canberra ACT 2601.

12 bulk sediment samples from the Gulf of Carpentaria core GC-2 have been analysed by ICP for their Ca, Al, Fe, Ti, Mn, Na, K, Sr, Ba, V, Ni, Co, Cr, Cu, Zr, Y, La, and Ce contents. Each of the five stratigraphic units previously recognised were sampled to examine changes in bulk chemical composition across a continuous sedimentary sequence in which the depositional environment evolved from freshwater lacustrine, to saline lacustrine, to open marine.
The data form remarkably linear trends suggesting physical mixing of two sedimentary components as the predominant process controlling the compositions of these sediments. One component has high Ca, Sr and Mn, suggestive of carbonate. The other component contributes virtually all the sedimentary budget of the other elements, and is probably terrigenous clay. Minor contributions from heavy minerals such as zircon or magnetite may have added small amounts of some elements. A major role for organic complexing or changes in solubilities can be ruled out. Except for V and Mn, water composition apparently had no direct effect on sedimentation of the metals.

VARIATION IN WATER QUALITY OF STORAGES IN NEW SOUTH WALES, AUSTRALIA. ANALYSIS BASED ON NUMERICAL CLASSIFICATION.

Norris, R.H., Jordan, T., English, P. Water Research Centre, Canberra College of Advanced Education, Canberra, Australia 2616.

Six storages in New South Wales, used mainly for irrigation and some domestic supply, were selected for comparison on a regional basis and to determine variation in water quality. The storages are all in mainly agricultural catchments and range climatically from warm to cool temperate. Water quality was monitored by the regional water authority, without replication, and collection frequencies from two months to two weeks. Five years of data were selected and analysed for annual periods over the growing season, July to June. All reservoirs had high nutrient levels with averages over the five years of >50 ug l^{-1} total phosphorus and nitrate levels >650 ug l^{-1}. Total nitrogen was not measured. Based on chlorophyll *a* and nutrients, dam sites for each reservoir were generally grouped together. Some reservoirs were variable with sampling times falling into several groups, usually representing relatively extreme annual values, which are interpreted as outlying events. These reservoirs were either small capacity or had substantial point source nutrient inputs. Despite consistently high nutrient values no reservoir always exhibited correspondingly high chlorophyll *a* levels during the growing season, and reasons for this are still to be explained.

POPULATION LEVEL EFFECTS OF ENDOSULFAN ON CATFISH

Barbara Nowak
School of Biological Sciences, F07, University of Sydney, NSW 2006 and Centre for Environmental Toxicology, State Pollution Control Commission and University of Technology, Sydney, NSW.

Endosulfan is an organochlorine pesticide which replaced DDT in cotton growing areas in NSW. Australian freshwater catfish Tandanus tandanus does not migrate thus forming local populations which may be endangered by localized pollution. Populations of catfish were sampled from Gwydir river (cotton growing area), Horton river (control) and Pindari Dam (control). All catfish collected from Gwydir river during endosulfan application season (summer 86/87, 87/88, 88/89) contained residues of endosulfan ranging from 2ppb to 307ppb. No relationship was found between somatic index, gonadal index, condition factor and endosulfan presence. Fecundity of females from the class size 420-485 mm was lowest in the population from Gwydir river (mean number of eggs per kg of body weight: Gwydir-6802, Horton-8401, Pindari Dam-8890). Due to small sample size the difference was not statistically significant.

THE ASSOCIATION OF PHOSPHORUS WITH SUSPENDED PARTICLES AND COLLOIDS IN THE MURRAY RIVER.

R. L. Oliver[1] and G. Douglas[2].

1 Murray Darling Freshwater Research Centre, Albury, NSW.
2 Centre for Stream Ecology, Chisholm Institute of Technology.

Suspended particulate matter in water samples taken from sites along the Murray River was size fractionated and concentrated using continuous flow centrifugation and tangential flow filtration. Phosphorus analyses on the five size fractions obtained from each site showed surprisingly small differences in the mass of phosphorus per unit dry weight of particles, even though the nominal diameters of the largest and smallest particle fractions differed by a factor of 10^4. Differences between sites were also unexpectedly small. These results will be discussed in relation to the composition of the particles and the availability of phosphorus for algal growth.

LATE HOLOCENE RECORD FROM A TROPICAL LOWLAND BASIN: WAIGANI LAKE, PAPUA NEW GUINEA

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[2]School of Geography, University of New South Wales.
[3]Department of Biology, University of Newcastle-upon-Tyne.

Sediment cores (up to a depth of 4.8 m) were collected from Waigani Lake (9°22'S, 147°10'E) in lowland Papua New Guinea. A pale-coloured clay formed the bulk of the cores, extending from 0.75 m to 3.8 m depth. Carbon-14 dates show that this layer was deposited between about 950 ± 90 BP and 2540 ± 80 BP. This equates to an average rate of sediment accumulation of approximately 1500 mm per 1000 years and indicates a very high erosion rate if all this material were derived from the small local catchment. Diatom counts from core sections indicate rapid sediment deposition during this period and generic composition indicates a switch from epiphytic diatoms to more open-water species. Clay mineralogy and elemental analyses (XRF) showed that the bulk of the sediment prior to 950 BP was not derived from the local catchment but from the Laloki River, into which the present-day lake drains. Consequently, this older record can not be used to assess erosion rates within the Waigani Lake catchment area but the site may prove useful in assessing changes in the local and regional environment since the last glacial.

SUCCESSIONAL MECHANISMS OPERATING ON BIOGENIC SUBSTRATE PATCHES IN A SAND-BED STREAM. Nick O'Connor, Department of Botany & Zoology, Monash University, Clayton VIC. 3168

Three alternative models have been proposed describing the mechanisms controlling successional change in communities following disturbance; facilitation, tolerance, & inhibition. These models were tested in a controlled field experiment on sand substrate patches in the Pranjip-Creightons Creek System of north-central Victoria. In late summer large patches adjacent to the main flow are colonized by the larvae of the caddisfly, *Cheumatopsyche*. Silken retreat and net construction by *Cheumatopsyche* modifies the substrate. Experimental treatments involved removal of either *Cheumatopsyche*, the mayfly nymph *Baetis*, or total disturbance. After 48 hours *Baetis* preferentially recolonised plots previously modified by *Cheumatopsyche*, thus confirming the facilition model.

MANAGING WATER RESOURCES TO SUPPLY ENVIRONMENTAL WATER REQUIREMENTS

Richard Peck
Victorian Department of Water Resources

Protection and/or enhancement of environmental values associated with water resources are increasingly being recognised as legitimate management goals. Victoria has moved towards assembling the necessary knowledge base, legislative framework and administrative guidelines to plan and manage aquatic systems to meet a range of environmental objectives. Implementing these changes and assessing the outcomes will require co-ordinated scientific, managerial and institutional action. The potential impact of these changes and some of the issues arising are discussed, with emphasis on opportunities for appropriate scientific inputs.

MORPHOLOGICAL VARIATION IN THE LARVAE OF THE CHIRONOMID *Coelopynia pruinosa* FREEMAN

VINCENT PETTIGROVE
Water Quality Assessment Section
Rural Water Commission of Victoria

The investigation of morphological deformities in Chironomidae larvae has become a popular means of detecting toxic contamination in freshwater systems. One problem associated with such studies is evaluating what constitutes a structural abnormality. In an attempt to address this problem, the ligula and paraligulae of the chironomid *Coelopynia pruinosa* Freeman were examined from specimens collected throughout eastern Australia. Both these structures showed considerable variation, however the types of morphological variation could be clearly separated into those representing natural variation in the population and those produced by environmental stress.

THE USE OF MEGACONDOM ENCLOSURES FOR EXPERIMENTS WITH CHIRONOMIDS IN SHALLOW WETLANDS.

ADRIAN PINDER, SUE HARRINGTON AND JENNY DAVIS
SCHOOL OF BIOLOGICAL AND ENVIRONMENTAL SCIENCES
MURDOCH UNIVERSITY, MURDOCH, W.A. 6150.

Field testing of temephos (an organophosphate pesticide) against chironomid (midge) larvae was carried out using portable plastic enclosures as part of a midge control research project. This pesticide has been used for the past 20 years on a fairly ad-hoc basis to reduce midge larval populations, and in recent years a decline in the effectiveness of temephos has been observed. Determination of the toxicity of temephos to midge larvae has been a major priority of our research programme. Laboratory tests have been useful in determining the efficacy of temephos under controlled conditions, however field tests using enclosures were required to more realistically assess temephos as a midge larvicide. The design of the enclosures and results of their use in the field are presented in this paper.

ENVIRONMENTAL ISOTOPES IN LAKE AND RIVER STUDIES

L.A. (CHAMBERS) PLUMB
Water Resources, CSIRO, GPO Box 1666, Canberra 2601, Australia.

The relative abundances of the stable isotopes of hydrogen ($^{2}H/^{1}H$), oxygen ($^{18}O/^{16}O$), sulphur ($^{34}S/^{32}S$) and carbon ($^{13}C/^{12}C$) can be used as tracers and indicators of processes in lakes and rivers.
The altered isotopic composition of evaporated waters and its use as a tracer is illustrated with reference to irrigation waste water and the inflow of dammed waters to rivers.
The ratios for both sulphur and carbon exhibit great variability, particularly as a result of fractionation during biological processes. The use of sulphur isotopes is illustrated in a study of gypsum and groundwater associated with ephemeral lakes in a high supratidal zone. In another investigation of ponds forming on the rim of Rangiroa Atoll, it is the carbon isotopic signature which is of particular interest. High-Mg calcites are forming within a microbial mat and isotopic evidence suggests that dissolved inorganic carbon in the peripheral groundwater is the principle source rather than carbon derived from the degrading organic matter.

THE UTILITY AND APPLICABILITY OF THE IN-STREAM FLOW INCREMENTAL METHODOLOGY (IFIM) FOR AUSTRALIAN LOTIC ENVIRONMENTS

Pusey, B.J. and Arthington, A.H. Centre for Catchment and In-stream Research, Griffith University, Brisbane AUSTRALIA

The IFIM was used to assess changes to fish habitat availability in Barambah Creek, Murgon, Queensland following construction of the Bjelke-Petersen dam. The generated relationships between discharge and habitat availability were used to assess the potential changes to fish species diversity and the abundance of rare species, species included in the amateur angling industry and of macro-invertebrates. Two major responses of habitat availability to discharge were revealed by the simulation process. The first was a linear or curvilinear response of increasing habitat with increasing discharge and was demonstrated by the majority of small-bodied fishes. The second response, or more properly, lack of response was shown by larger bodied fish including those considered rare and those considered important angling species. The majority of these species could be properly considered pool dwellers. The Bjelke-Petersen Dam is expected to reduce discharge in Barambah Creek by about 50%. This should result in a decrease in habitat availability of approximately 50% for the species considered. The discharge of rivers of S-E Queensland shows marked seasonal and annual variability and therefore so should habitat availability. In determining the impact of the B-P Dam it is necessary to know the importance of habitat to the regulation of the fish communities of such rivers. We believe that the variability of the flow regime and the incidence of flooding are more important structuring agents and that fish communities rarely reach densities high enough to generate conditions where habitat is a limiting resource. Operating conditions of the dam have a greater potential for impact on the fish fauna than a simple reduction in discharge. Release of water for downstream removal for irrigation is scheduled to occur in periods of predictably low flows at a time when many species reproduce.

A REPLACEMENT SERIES EXPERIMENT WITH MACROPHYTES.

Naomi Rea Botany Dept., Adelaide University.

Individually the aquatic macrophytes *Triglochin procerum* and *Baumea arthrophylla* have marked responses across a water depth gradient. In mixture these responses may alter and so influence the composition and structure of the vegetation in question. To test the outcome of species interaction coupled with water depth the Replacement Series design was used. The plants were grown together in various proportions with the density held constant. The experiment was replicated in shallow (<20cm) and deep (>70cm) water and recorded for 20 months (July'87-Feb.'89). The harvested plants were dry-weighed and the allocation of total P, N, organic Carbon, Na and K to all plant parts determined.

DESCRIBING WATER REGIME

Jane Roberts
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Resource managers faced with increasing demands on water resources are being required to state what water is required and when, the so-called "environmental allocation" for wetlands. However, Australian data are few, and existing models of the relationship between water regime and wetland plants are either conceptual-qualitative or site-species specific. This paper describes the first stage in the development of a broad, quantitative model - the description of water regime from hydrological data - and discusses its values and limitations.

A BIOLOGICAL ASSESSMENT OF A POLLUTED WETLAND

David P. Robinson
Environment Protection Authority, Victoria

Lake Coleman is a large wetland of about 3000 ha in the Gippsland Lakes region of Victoria. The lake has been subjected to a discharge of sewage and industrial waste for about 30 years. A study was carried out in 1986 and 1987 of the littoral macro-invertebrate, fish and bird fauna of Lake Coleman and a nearby unpolluted wetland Dowd Morass. Some comparison with biological data collected in the 1970s was also possible. Marked improvements in the invertebrate fauna and slight improvements in the fish and bird fauna were noted. In Lake Coleman the richest invertebrate fauna was at a site mid-way between the inputs of wastewater and saline Gippsland Lakes water. The fauna at this site was comparable to that of the unpolluted wetland and it was considered that the differences were more due to differences in the salinity regimes of the two wetlands than to the effects of the discharges.

BILLABONG PERIPHYTON DYNAMICS

Oliver Scholz[1], Paul I. Boon[2], and Neil D. Hallam[1].
1) Department of Botany and Zoology, Monash University. Clayton, Vic. 3168.
2) Murray-Darling Freshwater Research Centre, P.O. Box 921. Albury. N.S.W. 2640.

The dynamics of periphyton communities have not previously been studied in Australian billabongs. The involvement and importance of these communities in nutrient cycling and in the degradation of organic matter, particularly on submerged River Red-gum (E. camaldulensis), is currently being investigated in billabongs near Albury-Wodonga. Natural substrata, constructed from aged River Red-gum, and artificial substrata, constructed from glass slides, are used to follow spatial, temporal and successional dynamics of microbial communities. The exoenzymatic degradation of structural carbohydrates, organic phosphorus, and proteins is being monitored and related to communal demography and ambient physicochemical parameters. Results to date suggest that cellulose breakdown is slow (140 $umol.cm^{-2}.day^{-1}$), but proteins and organic phosphorus compounds are rapidly degraded (1200, and 3300 $umol.cm^{-2}.day^{-1}$, respectively).

STATE OF WATER POLLUTION AND WATER QUALITY MANAGEMENT STRATEGY IN THAILAND

Dr. Sittiporn Ms.Nittaya Nugranad
Environmental Quality Standards Division, Office of the National Environment Board, Bangkok, Thailand

As the result of the implementation of the National Economic and Social Development Plans (NP), Thailand is faced with rapid population growth and economic development, becoming industrialized and urbanized at an accelerated rate. These developments have inadvertently resulted in serious environmental deterioration especially the quality of surface and groundwater in many regions of Thailand. Water in some major rivers is severely polluted by organic matter and contaminated by trace amounts of toxic substances such as heavy metals and pesticides. Groundwater in many shallow wells and the coastal waters of several tourist beaches are contaminated by coliform bacteria. Major sources of pollution are domestic, industrial, agricultural wastes, and other non-point sources. The sixth NP has included many environmental development programs to increase environmental protection. Thailand has many projects on environmental quality control supervised and coordinated by the Office of the National Environment Board (ONEB) and in cooperation of the ASEAN countries, Australia, Canada, Japan. The ONEB has also been setting up "Water Quality Standards and Criteria for Thailand" to control and to maintain water quality to levels that suit activities of concern and protect public health, and to conserve natural resources and the environment.
This paper includes the overview of the state of water pollution and water quality management strategy in Thailand. Roles and duty of responsible agencies are also described. A case study is also overviewed as an example.

ROOT AERATION AND RESPIRATION IN ELEOCHARIS SPHACELATA R. Br.

B.K. Sorrell, Murray-Darling Freshwater Research Centre, Albury 2640.

Roots of the emergent macrophyte Eleocharis sphacelata arise from a perennial rhizome, and rely on longitudinal oxygen transport from the erect culms to satisfy their respiratory oxygen demand. The root tips are particularly prone to oxygen deprivation, being the most active tissue and the furthermost point along the oxygen transport pathway. Their respirarory physiology was investigated, by placing excised tips in closed chambers fitted with an oxygen electrode. The Critical Oxygen Pressure for respiration (C.O.P.), a measure of the affinity of the tissue for oxygen, ranged from 6.0 - 8.0 kPa for root tips in moist air, but was always > 12 kPa in the liquid phase. This result reflects the additional diffusional barriers associated with boundary layer effects and flooding of the intercellular airspaces, and suggests that oxygen uptake by the tips is primarily limited by physical resistances to gaseous diffusion through the tissue. Further evidence for this explanation is that 70% of the oxygen uptake by the root tips is mediated by cytochrome oxidase, whilst the alternative cyanide-resistant pathway accounts for only 15% of respiration.

Life Histories of Trichoptera from the Wet Tropics of Queensland.

R. M. St Clair and J. A. Nolen.
James Cook University, Townsville, 4817.

Life histories of two species of Leptoceridae are being studied at Birthday Creek, Paluma. Here the creek is 9 m. wide and flows permanently with peak flow in the summer wet season. Preliminary results show that an undescribed species of Notalina is univoltine at this site and Triplectides gonetalus is either univoltine or has more than one generation per year. While populations of both species are somewhat asynchronous they are clearly seasonal with adults present over the warmer months. A population of the Calamoceratidae, Anisocentropus kirramus, is being studied further upstream on Birthday Creek where the temperature ranges annually from 12 to 23°C. This population is asynchronous at this site and emerging adults are present throughout the cooler months and probably all year. Generation time could not be determined because of the asynchrony. These results wil be briefly comparecd with results of life history studies of Trichoptera from around Australia.

Mechanical Mixers:- An alternative to aeration as a destratification technique. The Hyponga Reservoir Experience. P.J.Suter and G.Baldock.
State Water Laboratory, Engineering and Water Supply Department, PMB Salisbury P.O., SALISBURY , S.A. 5108

During the summer of 1988/89 submersible mixers were used to replace the aerator system used since 1980/81. Three FLYGT 4430 mixers were mounted on slides on the dam wall. These mixers could be raised and lowered and the angle of flow altered to optimise the mixing intensity.

The mixers were operated from October 1988 to May 1989 producing lower thermal stability than previous years. Mixing depth was greater extending to 5m below the mixers. Surface heating did not occur despite a near record hot spell in February/March. Algal biomass remained low.

The mixers were as effective but more efficient than the continuously operated aerator. The mixers used 15-25% of the power used by the continuously operated aerators, and provided a greater operational flexibility.

Changes in aquatic hyphomycete spore numbers in Lees Creek, ACT.
By K. THOMAS[1], G. A. CHILVERS[2] and R. H. NORRIS[1]
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Aquatic hyphomycetes in Lees Creek were sampled by membrane filtration: (i) every fourth hour over twelve hours at one site; (ii) at six sites along the stream, and (iii) at one site for 16 months. Spore numbers increased as the day progressed. Total spore numbers increased significantly through Sites 1 to 5 which were situated within similar native riparian vegetation. But spores decreased between Sites 5 & 6 where the stream passed through several kilometers of exotic riparian vegetation. A constant supply of substrate as the stream flows through the native vegetation probably enabled spores to be added to the stream faster than they were lost, while the downstream exotic vegetation failed to supply sufficient substrate and losses of spores exceed spore input. Spore numbers were highest from late summer to early autumn and at a minimum during late winter to early spring, which corresponds with the timing of maximum and minimun quantity of litterfall into the stream.

Litterfall in riparian vegetation over Lees Creek, ACT

By K. THOMAS[1], G. A. CHILVERS[2] and R. H. NORRIS[1]
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Riparian vegetation over Lees Creek is dominated by *Eucalyptus viminalis*, *Acacia melanoxylon* with some *E. robertsonii* present. Litterfall was measured for 18 months using 20 randomly placed 0.5m^2 litterfall collectors over Lees Creek. The collectors were emptied mid month, litter was dried at 95 C^o for 3 days then weighed. Mean annual total litterfall was 4.64 T/Ha comprised of *Eucalyptus* spp. leaves 42%, *A. melanoxylon* phyllodes 8%, leaves of other species 2%, Bark 13%, Twigs <8mm 18% & misc. material 17%. With the exception of twig fall all the remaining components of litterfall showed distinct seasonal patterns. Peak litterfall was in Feb. and minimum fall in Aug., 53% of all litterfall occurred from Dec. to Mar. The contribution to seasonal litterfall by *Eucalyptus* leaves ranged from 17% in Aug 1988 to 64% in May 1989 while the contribution of twigs to litterfall ranged from 4% in May 1989 to 60% in Jul & Aug 1988.

Leaf breakdown in a forested upland stream (Lees Creek ACT)

By K. THOMAS[1], R. H. NORRIS[1] and G. A. CHILVERS[2]. 1 Water Research Centre, Canberra C.A.E. PO Box 1, Belconnen, ACT 2616. 2 Dept. of Botany, Australian National University GPO Box 4, Canberra City, ACT 2601.

Abscissed leaves of *Eucalyptus viminalis* and picked mature phyllodes of *Acacia melanoxylon* were dried and immersed in the stream in summer and in winter using bags of 7 mm and 0.5 mm mesh. Also three separate leaching procedures (i) ether (ii) ether & ethanol (iii) ether, ethanol & hot water, were applied to other leaves and phyllodes in 7 mm bags. Treated eucalypt leaves were placed in the stream in summer and the *Acacia* phyllodes in winter. Aquatic hyphomycetes sporulating on 6 mm dia. disks from the leaves were identified and the number of species recorded. The leaves were dried and weighed. Leaves and phyllodes were broken down slower in small mesh bags, and in summer. Eucalypt leaves were broken down faster than *Acacia* phyllodes. Leached eucalypt leaves were broken down faster than unleached leaves while leaching either slowed or did not affect the break down rate of *Acacia* phyllodes. Fungi were detected earlier on leached leaves, in summer, and on *Acacia* phyllodes, relative to unleached leaves, in winter and eucalypt leaves respectively. The mean number of species detected did not differ significantly between the leaching treatments.

The environmental impact of river regulation in the River Murray, South Australia

M.C. Thoms, River Murray Laboratory, Department of Zoology, University of Adelaide, Box 498, G.P.O., Adelaide, South Australia 5001.

Sediments deposited in natural and man-made impoundments preserve a record of the operation of geomorphic and limnological processes. Changing environmental conditions may be indicated by sedimentary sequences. A series of sediment cores, extracted from a number of weir pools in the lower Murray, is currently undergoing analysis to assess the environmental impact of river regulation in South Australia. Preliminary data presented indicate a marked change in the sediment character since regulation. The benefits of such a study to geomorphologists, limnologists and engineers are outlined.

The Conservation Status of Inland Lakes in NSW

by Brian Timms, Avondale C.A.E., Cooranbong, 2265.

In an overview for the State Pollution Control Commission of NSW, I visited 102 lakes throughout NSW during the 1988-9 summer, to ascertain their ecological health. The sites chosen covered a spectrum of geomorphic types in approximate proportion to their perceived relative abundance, and also ranging from some known 'polluted' lakes to supposedly pristine sites in National Parks. Besides collecting data on catchment characteristics and on some geomorphic and physicochemical parameters, attention was focused on the diversity and abundance in zooplankton and littoral communities.

From a preliminary analysis of the data a majority of lakes, near the coast, are adversely affected by the Top Minnow Gambusia affinis, a number in the far west, are badly silting due to catchment erosion, some are polluted with excess nutrients, while a few managed floodplain lakes are visually impaired and have depauperate littorals due to overfilling. Perhaps most embracing is the apparent change in the limnological nature of most, especially billabongs, associated with past and present catchment management.

IS LAKE KUTUBU OLIGOMICTIC?

R.G. Totome and P.L. Osborne

Biology Department, University of Papua New Guinea, P.O. Box 320, University P.O., National Capital District, Papua New Guinea.

Anecdotal evidence suggests that Lake Kutubu, Southern Highlands Province, Papua New Guinea is oligomictic. Depth profiles of temperature, oxygen, nutrients and other physico-chemical features measured over two days in September 1988 indicated two distinct layers with a metalimnion at 25 m. The epilimnion was well-oxygenated and was between 1.6 and 3.0 °C warmer than the deoxygenated hypolimnion. Elevated concentrations of nitrite, ammonium, soluble reactive phosphorus, iron, lead, manganese, sodium, potassium, calcium, magnesium, silica and bicarbonate in the hypolimnion suggest prolonged stability of the water column. Temperature, oxygen and nutrient profiles measured in January and April 1989 were similar to those described above This marked stratification together with anecdotal evidence and the absence of any suggestion of a seasonal cycle in productivity supports the conclusion that Lake Kutubu is oligomictic.

MANAGING WATER BODIES USING OBSERVATIONS OVER APPROPRIATE TIME PERIODS

R.J. Wasson
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The internal adjustment times of water bodies that have been recently perturbed, and the frequency of major perturbations, span time periods from years to millennia. The maximum possible flood may have a return period of 10^4 years, carrying vast amounts of sediment and organic detritus. The internal adjustment time of a large catchment following clearing may be more than a century. These concepts will be illustrated using data from the Magela Plain, in Kakadu National Park, and from the Southern Tablelands of NSW and the ACT.

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Physical Limnology of a River Murray Billabong

In early 1989, a measurement program was commenced on a billabong near Albury, NSW with the aim of determining how turbulent mixing affects the growth rates and distributions of algal cells in natural waters. Turbulent mixing intensity is determined by the flow of thermal energy (stratification inhibiting mixing) and mechanical energy (wind stirring increasing mixing). Due to variations in the energy input to a water body, mixing intensity is highly variable in time and in space. The physical component of the study seeks to describe these variations, their causes, and their consequences for the availabilities of light and nutrients to algal cells in a particular water body representative of the shallow, turbid water bodies ubiquitous in Australia. In our talk, we will describe the project, some results, and the implications of these results to algal productivity.

The 1989 D.M. Scienceperson Memorial Door Prize Award Report

by Tim Doeg

The ASL has a number of prizes of excellence that are awarded to members. The Jolly Award (the equivalent of the Brownlow Medal) and the Student Prize are just two of them. There is only one thing wrong with these awards. To win them - you have to be good, very good! Such blatant descrimination and elitism goes against the grain of the anarchical collective that is the ASL. To overcome this, the ASL D.M. Scienceperson Memorial Door Prize Award was instigated. This was intended as a more egalitarian prize, able to be won by any member of the society.

The requirements for being selected for the Door Prize (to use the short title) are fairly simple. It is awarded to the person, or people, or thing or things, or animal or animals who contribute the most memorable moment to the Annual ASL Conference.

This can be through an entertaining (deliberate or not) talk, but can also be awarded for a single sentance, or indeed a single word within a talk. Not so long ago Andrew Boulton of the University of Adelaide was nominated for his single word reaction to a recalcitrant slide projector. The identity of the actual word has been lost in time, but an urban legend has it that the word started with an "F".

But onto the 1989 nominations:

Initially Richard Norris of the CCAE was considered for services to conference organisation and Continental breakfasts, but after consultation by the Door Prize Executive with Dr. Norris, during which he wore his karate belt and held the certificate of self-defence from the Hell's Angels Institute of Social Interactions, it was decided that conference organisers should be exempt from the award.

This didn't matter, as there were plenty of nominations during the conference to take his place.

Nominated for Services to Sex Aids category were Martin Thoms of the University of Adelaide for the invention of the Vibro-corer (which he added was for use by "Wimpo-Limnos") and Adrain Pinder of Murdoch University for the Mega-condom. Unfortunately, Adrian neglected to notice that the megacondom in question had holes in both ends, and for it to be functional, one end had to be

sealed with bricks (I wonder what the NAC-AIDS council would have to say about that?).

The Benny Hill special mention nomination went to Jodie Hoey, of the Warrnambool Institute, for the astute observation that "44% of the male population have sexual abberations". This was partly confirmed when Mike Geddes (University of Adelaide) professed his deep admiration for the Murray Crayfish, and later in the conference when Wayne Fulton (Inland Fisheries Commision, Tasmania) confessed his feeling towards the Tasmanian Cray, Jodie failed to win because it was thaught that 44% must have been a gross under- estimation.

The Sampling Methods Nomination went to Garry Thorncroft (Fisheries Research Institute, NSW) for his services to rotenone. The Multiple Author Nomination goes to Leon Barmuta (ex- University of California) for having one author to give the talk, one who did the work, one who organised the finance and one who made the coffee. If this trend continues (the nomination of multiple speakers), we can expect to see the Mormon Tabernacle Choir on stage next year at Kakadu.

Someone suggested that those members of the society who used the Friday afternoon seminar on Geolimnology to indulge in a round of Golf should also be nominated. This nomination was rejected on the basis of a vito by one of the Door Prize Committee.

The Zealous Limnologist Nomination went to Ken Thomas (Canberra College of Advanced Education). While most mortals can only face giving one talk per conference, and that with difficulty, Ken shone out with not one, but two talks, and a poster presentation!

Rick Wood (Chisolm Institute, Victoria) received a special nomination for locking himself out of his room during a shower on Saturday morning. The sight of Rick, dressed only in a T-shirt, jeans and bare feet in the Canberra winter, seemed to represent the ideal of the Door Prize. At least he was better dressed after locking himself out of his room again on the Sunday.

Also included for special mention were David Mitchell (Murray Darling Freshwater Research Institute) for services to the poker machine industry, Peter Davies (Inland Fisheries Comission, Tasmania) for the "Spawn 'till you die" T-shirt, and Vince Pettigrove (Rural Water Comission, Victoria) for contributions to dental surgery on chironomids.

But, as always, there can only be one winner.

And the unanimous winner of the 1989 D.M. Scienceperson Memorial Door Priza Award was Jennie Chaplin of the University of Woolongong. The richly deserved award was for the most entertaining talk entitled "The Sex Life (or lack of it) of an Ostracod", which included the lines that may be recorded as the highlight of the conference - "Ive been looking for males and sex for a year in New South Wales. I haven't found any. The story of my life."

It should be added at this point that Terry Hillman, receiving the award on Jennie's behalf said "I wish I could say that I taught her all she knows".

The Door Prize Committee (this year comprising L. Barmuta, J. Roberts and T. Doeg) congratulate Jennie Chaplin for an outstanding win, and commiserate with those other nominees who may have missed out. Better luck next year!

Proposed Standards for Biologists Undertaking EIS Work

The following note was received from Helen Lew Ton, the AMSA secretary and is reproduced here for the interest of members of ASL.

Some years ago the Australian Institute of Biology raised the issue of accreditation of environmental biologists with the National Association of Testing Authorities, Australia (NATA). As a result a joint working party was established to look into the matter.

Summary of Recommendations:-

a) **Assesors.** Suitably qualified people will be invited to join a panel of EIS assessors by a Technical Advisory Comittee. Each EIS assessor would be empowered to guarantee (by accreditation) the competence of a biological investigator to carry out a proposed investigation. This accreditation would guarantee not only the competance of the investigator but would also the appropriateness of the methodology to be employed. EIS assessors would make recommendations in respect of two kinds of investigations:-

1. Environmental Impact Studies.
2. Long Term Monitoring Studies

Qualifications for assessors include a higher degree, 10 years relevant professional experience, taxonomic, ecological and analytic expertise and competance in scientific writing. Appointment as an assessor would be for an initial 5 year period.

b) **EIS operators** (biological investigators). Application for registration would be made to NATA. A fee would apply. Once registered, an annual fee would be payable for the duration of the project.

c) **Technical Advisory Committee.** A committee of 12 including 1 environmental lawyer and 9 experts members. All ecosystems to be covered and members to come from government, academic institutions and and EIS practitioners.

The Australian Institute of Biology

I write as one of the founder members of the ASL and also as one of the founder members of the Australian Institute of Biology (AIB). The purpose of this letter is to urge ASL members to consider joining the AIB, or at the very least to display the enclosed information leaflet for their colleagues to see.

Whereas the ASL is an association of people specifically interested in Australian inland waters, the AIB represents the interests of all biologists whatever their specific discipline. It promotes the interests of the biological profession by lobbying government at both the State and Federal levels. It furthers education and research into all aspects of biology, including of course limnology.

Symposia are held each year in different parts of the country, usually on interdisciplinary topics which have so far included creationism, the funding of biological research, aquatic ecotoxicology, bioethics, and the evolution of the Australian biota.

The membership of the AIB is widely drawn from education at the secondary and tertiary levels, from the State and Federal government bodies, from industry, from self-employed people, from students, and from people not at present in the work force.

All professional biologists are cordially invited to join,

W.D. Williams,
President.

Federation of Australian Scientific and Technological Societies

Newsletter Number 29 July 1989

FASTS' President Report to the Board

FASTS' Board representing each of the discipline areas in science and technology meets twice a year. On June 22nd the Board and the Executive met in Canberra. The following is a precis of the report to the meeting by the President, Professor Frank Larkins.

Maturity of FASTS

After 3 1/2 years FASTS is paying dividends and has become a credible S&T lobby group looked to for leadership by the S&T community and increasingly approached by the government, opposition and industry for advise. The intense media activity over the last six months culminating in the Government's May Statement is a vindication of the vision people had when FASTS was established. FASTS has become a professional organisation which provides a progressive and constructive viewpoint - an independent and alternative analysis.

The Importance of our Standing Committees

FASTS needs to draw on the expertise of its membership for analysis and advice. FASTS could not simply be a reactive organisation. we needd to anticipate events and to provide counsel before decisions are made that may lock in a Minister or Department. We need to look at options and to have a long term vision for S&T for Australia for 5, 10 years and longer. Standing committees were the means by which FASTS can do this.

Solidarity of the S&T Community

Whilst individual societies need to represent their discipline area issues affecting S&T as awhole are better served by collective bargaining by the whole S&T community through FASTS. Even where other organisations could cover some areas they fared better with assistance from FASTS such as with education, the CSIRO. With regards to the ARC, FASTS really had a unique role in co-ordinating input. Likewise wth the 150% tax incentive, industry appreciated FASTS' role in representing its interests.

Australian Research Council Membership

With the resignation of Professor Max Neutze (Humanities and Social Science) and the untimely death of Professor Kevin Stark (Earth Sciences and Engineering) attempts were made to break the

nexus whereby chairs of disciplinary committees also had membership of the Council. FASTS met with the members of the disciplinary committees and took a letter to the Minister John Dawkins, which 37 members had signed supporting the continuation of the nexus. FASTS also made strong representations on the issue, followed up with a letter. It appears that the Minister has not acknowledged the merit of FASTS' position and will take action consistent with the principles FASTS advocated.

Australian Industry Research Group
The President reported on his talk (copy available on request from FASTS) to the AIRG which comprises the R&D Managers of Australia's 60 largest companies having a significant R&D interest.

Discipline Review on Teacher Education in Mathematics and Science
The President reported on his work on the Steering Committee of the Review as an alternate member of the Review in SA and Victoria. A draft report should be available at the end of July. It will consist of a volume of Statistics, one on a State-by-State analysis and one on recommendations to the Federal Government - many in co-operation with the states.

Crisis in Science for Primary Industries Conference

The President reported on the successful conference organised by the Australian Geoscience Council, FASTS and the Australian Institute of Agricultural Science. He and Ruth Dircks were speakers at the conference (Ruth is the President of the Australian Science Teachers' Association and a FASTS' Board Member).

New Executive and Board to be Elected in November
FASTS has gathered a momentum which needs to be conserved and increased with the New Board and Executive. Thought should be given to who might serve on these.

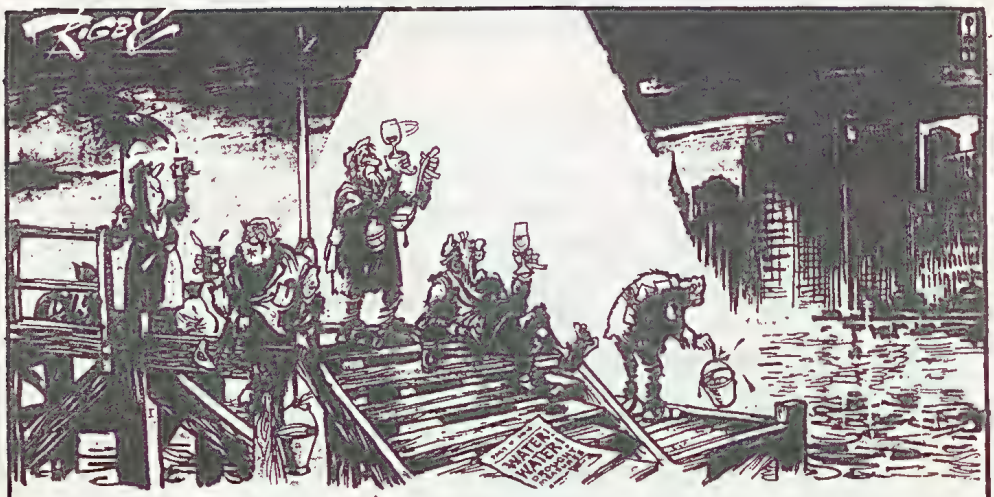
Policy Forum for FASTS for 1 November
FASTS will hold a policy forum on November 1st in Canberra for FASTS Member Societies to provide direction for the new Executive and Board. The forum will be organised along the following lines:-

*each society would be invited to send one or two people, President and Secretary or proxies authorized to speak on behalf of their Society; there would be no outside people invited;

* plenty of notice and follow-up would be provided

*FASTS standing committee Convenors would prepare 1-2 page papers by 1 October which would outline a number of points for discussion; they would speak to these papers briefly at the Forum.

The meeting will coincide with FASTS' Council and AGM. Member Societies will be able to elect new Board members, who will in turn elect FASTS' New President and Executive.



'I've always liked the full-bodied East River, but I must say the Hudson is a trifle more impudent. . . .'

May 24, 1989

Dear Ladies and Gentlemen:

Having just graduated from the University of Michigan (where I obtained a Bachelor of Science in Natural Resources) and desiring a position in water or wildlife management in Australia, I wish to obtain more information about environmental opportunities in your country about which you may know and/or with your organization.

I feel that my educational background and work experience would enable me to meet the challenges of the field of water or wildlife management in Australia. Working as a teaching aide in a high school biology class and an U.S. Forest Service Field Assistant as well as a variety of college courses have provided the basic knowledge needed to perform and teach resource monitoring, inventory, data collection, and planning. Employment as a laboratory assistant exposed me to independent work involving research and use of scientific techniques which would be valuable in a wildlife or water related position. Finally, outdoor experience (such as scuba diving, camping and backpacking), the ability to do hard physical labor, the willingness to work hard, and even previous travel experience in Australia would be useful in an environmental position in Australia.

I am interested in an environmentally related position because I would like to gain experience in the field of resource management (specifically water or wildlife management) since it is a field I hope to pursue as a a career. In addition, I would like to contribute my enthusiasm and knowledge to further research and wise use of the natural resources of Australia. Thus, I would like to receive more information about temporary and permanent environmental opportunities, such as work activities, benefits, requirements, and dates of work. Since I will be making decisions about future plans soon, I would greatly appreciate receiving information about opportunities from you as soon as possible. In addition, feel free to call me if you would like to discuss my qualifications and expectations regarding a position. Finally, a resume and references are available upon request. Thank you for your consideration.

Sincerely,

Elizabeth Jay

Elizabeth Jay

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LIMNOLOGY BIBLIOGRAPHY

Only a few titles have reached me as yet; the bibliography can only be complete if everyone sends his/her current publications. For those of you who missed the AGM, I revised Russ Tait's request for "titles only"...full reprints would be appreciated if possible...we are establishing a reprint collection at MDFRC, also electronic storage of relevant details and key words. [Address again: R. Shiel, MDFRC, P.O. Box 921 Albury, 2640, N.S.W.]

1988

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BOULTON, A.J. Over-summering refuges of aquatic macroinvertebrates in two intermittent streams in central Victoria. *Trans. R. Soc. S. Aust.* **113**, 23-34.

BURKE, C.M. & B. KNOTT. Limnology of four groundwater-fed saline lakes in south-western Australia. *Aust. J. Mar. Freshwat. Res.* **40**, 55-68.

CLEMENTSON, L.A., G.P. HARRIS, F.B. GRIFFITHS & D.W. RIMMER. Seasonal and inter-annual variability in chemical and biological parameters in Storm Bay, Tasmania. I. Physics, chemistry and the biomass of components of the food chain. *Aust. J. Mar. Freshwat. Res.* **40**, 25-38.

HORTLE, K.G. Use of emetics to obtain stomach contents of the rock flagtail *Kuhlia rupestris* (Pisces: Kuhliidae), with notes on the diet and feeding. *Bull. Aust. Soc. Limnol.* **12**, 21-27.

HORWITZ, P. The faunal assemblage (or pholeteros) of some freshwater crayfish burrows in south-west Tasmania. *Bull. Aust. Soc. Limnol.* **12**, 29-36.

HYNES, H.B.N. *Tasmanian Plecoptera. Aust. Soc. Limnol. Spec. Publ.* **8**, 1-81.

KOSTE, W. & R.J. SHIEL. Rotifera from Australian inland waters. III. Euchlanidae, Mytilinidae and Trichotriidae (Rotifera, Monogononta). *Trans. R. Soc. S. Aust.* **113**, 85-114.

MARCHANT, R. A subsampler for samples of benthic invertebrates. *Bull. Aust. Soc. Limnol.* **12**, 49-52.

MARCHANT, R. & P. LILLYWHITE. A freeze-corer for sampling stony river beds. *Bull. Aust. Soc. Limnol.* **12**, 41-48.

MCKENZIE-SMITH, F. A note on the diet of late-instar nymphs of *Eunotoperla kershawi* (Plecoptera: Grypoterygidae). *Bull. Aust. Soc. Limnol.* 12, 37-39.

NEBOISS, A. Additions and corrections to the Atlas of Trichoptera of the SW Pacific-Australian region. *Occ. Pap. Mus. Vict.* 4, 63-67.

NEBOISS, A. & K. WALKER. Types of Trichoptera (Insecta) held in the Museum of Victoria. *Occ. Pap. Mus. Vict.* 4, 43-56.

NEBOISS, A. & K. WALKER. Types of Plecoptera (Insecta) held in the Museum of Victoria. *Occ. Pap. Mus. Vict.* 4, 57-61.

NEBOISS, A., J. JACKSON & K. WALKER. Caddis-flies (Insecta: Trichoptera) of the World Heritage Area in Tasmania - species composition and distribution. *Occ. Pap. Mus. Vict.* 4, 1-41.

SUREN, A.M. & P.S. LAKE. The fauna of macrophytes and unvegetated substratum in two southern Victorian streams. *Bull. Aust. Soc. Limnol.* 12, 1-14.

THOMAS, K., G.A. CHILVERS & R.H. NORRIS. Seasonal occurrence of conidia of aquatic hyphomycetes (fungi) in Lees Creek, Australian Capital Territory. *Aust. J. Mar. Freshwat. Res.* 40, 11-23.

COMING EVENTS

1989

8-11 AUG Symposium "Biomanipulation-Tool for Water Management" Artis Zoo, Amsterdam, The Netherlands. Details from:- Convention Bureau,PO Box 1558, 6501 BN Nijmegen, The Netherlands.

6-10 AUG The Finnish Limnological Society presents a symposium titled "The Dynamics and Use of Lacustrine Ecosystems" Contact: Ms Kati Tyystjarvi, Finnish Science Centre Foundation, PO Box 166, SF-01301, TAA, Finland. PH: 358 0 85799, Fax 358 0 873 4142.

6-10 AUG International Society for Ecological Modelling (ISEM) North America Annual Meeting. Contact: Dr. Efraim Halfon, National Water Research Institute, Canada Centre for Inland Waters, Burlington, Ontario, Canada L7R 4A6.

7-10. AUG Pacific Science Association VI Inter Congress.Valparaiso, Vina del Mar, Chile. Contact: Prof. Dr. Hugo de Campos, Instituto de Zoologia, Universidad Austral de Chile, PO Box 567, Valdivia, Chile.

31 AUG-6 SEP Vth International Symposium on Paleolimnology. Contact Prof.Frank Oldfield, Geography Dept.,Univ of Liverpool,PO Box 147,Liverpool L69 3BX, UK.

11-16 SEP 6th International Symposium on Trichoptera, Lodz and Zokopane, Poland. Registration is before 30 Sept. 1988. For forms and other information contact Dr A. Nebois, Dept. Entomology, Museum of Victoria, 71 Victoria Crescent, Abbotsford, Victoria, 3067. Ph 419 5200

1990

20-23 APRIL ASL 29th Congresss and AGM, Jabiru NT, and Pre-Congress Symposium on the 11th "Water Management in the Alligator Rivers Region". Enquiries: Isabell von Oertzen tel: (089) 792 300, Fax (089) 792 076, Telex 85457.

2-7 JULY International Crustacean Conference, Brisbane, Australia. Contact:- Crustacean Conference Secretariat,Uniquest Limited, University of Queensland, St Lucia, Qld,4067.Ph (07) 377 2733, Fax (07) 870 3313

29 JULY-3 AUG International Association on Water Pollution Research and Control (IAWPRC) Biennial'90.Contact: Anthony Milburn, Executive Director, IAWPRC, 1 Queens Anne's Gate, London, SW1 H9BT, England. Ph:441 222 3848, Fax: 441 222 1818.

23-30 AUGUST V International Congress of Ecology "Development of Ecological Perspectives for the 21st Century", Yokohama, Japan. Contact: Secretary General's Office for Intecol 1990, Institute of Environmental Science and Technology, Yokohama National University, Yokohama 240, Japan.

5-8 SEP 1Vth International Conference on the Conservation and Management of Lakes "Hangzou'90". Hangzou, The People's Republic of China. Contact: Mr. Zhang Yuitan, Foreign Affairs Office, Chinese Research Academy of Environmental Sciences Beiyuan, Anwai, Beijing, People's Republic of China. Ph: 4211025, Cable: 1064, Telex: 22505 Booth CN.

1991

MAY XVII Pacific Science Congress, Hawaii. Contact: Dr. Jose Ireneu dos Remedios Furtado, Centre for Integrated Development, 19, Langford Green, Champion Hill, London SE5 8BX, England, UK. Ph (01) 733 8523, Fax (01) 299 0197.

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